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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/816,041	04/01/2004	Po-Kang Wang	HT03-039	9283

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EXAMINER

ANYA, IGWE U

ART UNIT	PAPER NUMBER
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2891

DATE MAILED: 11/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/816,041	Applicant(s) WANG ET AL.	
	Examiner Igwe U. Anya	Art Unit 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 August 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-49 is/are pending in the application.
- 4a) Of the above claim(s) 27-49 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-26 is/are allowed.
- 6) ☒ Claim(s) 1-7 and 10 is/are rejected.
- 7) ☒ Claim(s) 8 and 9 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>5/26/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I – Claims 1 - 26 in the reply filed on July 14, 2005 is acknowledged. The traversal is on the ground(s) that both the process claims and claims are directed to an MRAM array on a substrate. This is not found persuasive because, the process as described can be used to manufacture among others, a magnetic sensor as stated in the restriction action. Contrary to Applicant's argument that MTJ-array magnetic-sensors as being speculative, Kang et al. (USPAB 2004/0120185) teach such a device. Furthermore, a preamble is denied the effect of a limitation where the claim following the preamble is a self-contained description of the structure not depending for completeness upon the introductory clause. *Kropa v. Robbie*, 88 USPQ478 (CCPA).
2. The requirement is still deemed proper and is therefore made FINAL.
3. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1 and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee (USPAB 2005/0102720).

6. Lee teaches a method of fabricating an MRAM array on a substrate (fig. 16), comprising:

(a) forming a first conductive layer (21) comprised of a plurality of sectioned first lines on a substrate;

(b) forming an array of magnetic; tunnel junctions (MTJs 30) on the first conductive layer; and

(c) forming a second conductive layer (11) comprised of a plurality of parallel second lines on said MTJs wherein an MTJ is formed at each location where a second line crosses over a sectioned first line and wherein said second lines have thinner and thicker regions (figs. 15, 16); and

wherein said second conductive layer is comprised of second lines which are bit lines (paragraphs 34 , 36).

7. 2. The method of claim 1 wherein the first conductive layer is comprised of sectioned first lines formed on a first insulation layer and within a second insulation layer that is on the first insulation layer.

8.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1 – 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Gider et al. (US Patent 6873542).

12. AAPA teaches method for fabricating an MRAM array on a substrate (fig. 1), comprising:

(a) forming a first conductive layer (5) comprised of a plurality of sectioned first lines on a substrate;

(b) forming an array of magnetic; tunnel junctions (MTJs) (7) on the first conductive layer; and

(c) forming a second conductive layer (8) comprised of a plurality of parallel second lines on said MTJs wherein an MTJ is formed at each location where a second line crosses over a sectioned first line;

wherein the first conductive layer is comprised of sectioned first lines (5) formed on a first insulation layer (3a) and within a second insulation (3b) layer that is on the first insulation layer;

wherein said MTJs (7) are coplanar with a third insulation layer (6) that is formed on said second insulation layer

wherein said second conductive layer (8) is comprised of second lines which are bit lines (paragraph 5); and

forming a fourth insulation layer (9) on the third insulation layer (6), forming a fifth insulation layer (10) on the fourth insulation layer (9), and forming an array of parallel word lines (11) above said MTJs in said fifth insulation layer wherein said word lines are perpendicular to said second lines which are bit lines (paragraph 5).

13. AAPA lack wherein the second lines have thinner regions of thickness of about 0.02 to 0.3 microns and thicker regions of thickness of about 0.08 to 1.1 microns.

14. However, Gider et al. teach second lines of an MRAM having a thinner region formed above on an MTJ and thicker region formed above and outside the MTJ for reducing resistance.

15. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Gider et al. into AAPA to reduce resistance. Regarding claims 5 and 6, where the general conditions of a claim are disclosed in prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

16. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Gider et al. (US Patent 6873542), and further in view of Ooishi (US Patent 6815785)

17. AAPA/Gider et al. reference teaches the features previously outlined, but lacks wherein a bit line is a lower metal layer comprised of a first diffusion barrier layer or adhesion layer and a conductive layer which is copper or gold formed on the first diffusion barrier layer or adhesion layer.

18. However, Ooishi teaches a bit line or a lower metal layer comprised of a first diffusion barrier layer or adhesion layer (26a) and a conductive layer which is copper or gold (27a) formed on the first diffusion barrier layer or adhesion layer (col. 6 lines 28 – 40).

19. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Ooishi into AAPA/Gider et al. reference avoid copper diffusion and via poisoning.

20. Claims 8 and 9 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

21. Claims 11 – 26 are allowable, because prior art does not teach inter alia; forming a first set of trenches over an array of underlying MTJs and a second set of trenches not positioned above the underlying MTJs, filling the trenches with a conductor and planarizing to form a first and second set of contacts respectively, wherein the second set of contacts is thicker than the first set of contacts.

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22. Prior art made of record and not relied upon, considered pertinent to applicant's disclosure include Tsang (US Patent 6940749, Hidaka (US Patent 6778430), Katti (USPAB 2005/0152180), and Lee et al. (USPAB 2005/0214953).

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Igwe U. Anya whose telephone number is (571) 272-1887. The examiner can normally be reached on M - F 8:30am - 5:00pm.

24. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William B. Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

25. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Igwe U. Anya
Examiner
Art Unit 2891



B. WILLIAM BAUMEISTER
SUPERVISORY PATENT EXAMINER

IA

November 7, 2005